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PRELIMINARY RESULTS OF AN EXPERIMENTAL CUTTING ON THE TIMBER MOUNTAIN SAMPLE PLOT

by

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February 19 1929

U. S. GOVERNMENT PRINTING OFFICE: 1928 J 76133

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by

Hubert L. Person, Assistant Entomologist

The tree selection studies of the last four years have given us a fairly definite idea of the relative susceptibility of different types of western yellow pine trees to attack by the western pine beetle.[1] The purpose of these studies was to determine what trees should be removed in the first cut, so that losses in the reserve stand would be reduced to a minimum. Now that we know, in general, the type of tree that is preferred by the western pine beetle, the next step is to determine by experimental methods the effect of the removal of these trees on the subsequent infestation on our cutover areas.

In a study of the losses from insects on cutover areas in California it was found that on the poorer sites these losses often amounted to as much or more than the increment.[2] It seems reasonable to suppose that more careful marking, which would result in the removal of all the normally susceptible trees, would reduce this loss to a negligible factor. The proof of this supposition requires the study of the effect of the removal of trees of varying degrees of susceptibility, according to our present knowledge, on a number of sample areas of fairly large size.

The need for this test of our tree selection theories has been felt for the past two years, but the difficulty of finding suitable areas within "going" timber sales has prevented the initiation of the necessary experiments. The Pickering sale on the Badger Unit of the Modoc National Forest should provide the desired opportunity, and it is planned to start studies on this area during the 1929 season.

Because no suitable larger areas were available, a start on this problem was made in the winter of 1927-28 in connection with the study of the Timber Mountain sample plot. In September 1927 a study was made of the relative susceptibility of the trees on the north half of this 40-acre plot and about 60 per cent of the most susceptible trees were marked for removal, the purpose being to study the effect of this thinning on the subsequent infestation of this part of the plot as compared with the other half of the plot, which was left in a natural condition.

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[1] Person, Hubert L. Unpublished report on "Sample Plot Studies of Tree Selection by the Western Pine Beetle (D. *brevicomis* Lec.)"; January 15, 1929

[2] " Unpublished report on "Studies of Insect Losses on Cutover Areas of District 5"; February 20, 1926.

Through the interest of Mr. Woodbury and Supervisor Lyons arrangements were made for the removal of the susceptible trees by Mr. Fowler, a local rancher, under an administrative use permit. This was necessary, as there was no sale for the logs. The permit required the removal of designated trees by May 1, 1928, in the manner stated. The logs were to be hauled to a small portable mill at Straw, on the other side of Timber Mountain, where they were to be sawed. All brush was to be piled and burned under the direction of a forest officer.

In order to make the operation of some value as a control project, all trees containing overwintering broods of the western pine beetle were to be sawed up and the slabs burned at the mill or hauled out of the forest belt for use as firewood, before May 1, 1928, at which date the beetles would probably start to emerge.

METHOD OF SELECTING THE MOST SUSCEPTIBLE TREES

As the 20 acres to be cut over were a part of the Timber Mountain sample plot, on which the morphological characteristics, rate of growth and location of each tree with respect to the others had been recorded, it was possible to make a preliminary selection of susceptible trees on the basis of our records. Beside the removal of the most susceptible trees, which was the primary consideration, the aim was to leave a large reserve stand, as evenly spaced as possible.

Because of the extremely low average rate of growth of the trees on this plot (Fig.1) it was not possible to remove all the susceptible trees and still leave an appreciable reserve. Instead, only the most susceptible trees were removed and a good reserve, probably much larger than will be found practical on such sites, was left.

It was not to be expected that this thinning would entirely eliminate the insect damage on this area, especially in view of the fact that the plot is bordered on three sides by very severe infestations. The purpose was to determine what could be expected in the way of reduction of loss under conditions which are probably as unfavorable as any that will be encountered in western yellow pine stands.

After the preliminary selection on the basis of the records, in which rate of growth, tree class and size and thickness of crown were the primary considerations, a final selection was made in the field. Spacing in relation to diameter and possibilities for acceleration of growth was carefully considered in the field selection.

Each tree to be removed was blazed and stamped at the base and at breast height, according to standard Forest Service practice. As all the trees on the plot had been numbered and tagged with metal tags when the plot was established, each tree to be removed was also recorded by number.

All the marked trees were felled and logged in the spring of 1928. The logging was carefully done with horses, and little damage resulted to reproduction or the reserve stand. A few of the logs and all the slash still remained on the area in June 1928 but were being removed through the summer for firewood. Many of the old "red" and "black top" insect-killed trees were still standing on the area, but the party doing the logging said that he would remove these trees for firewood. Their absence would very greatly improve the appearance of the area.

The amount and percentage of the timber removed and left standing on the thinned area, in both volume and number of trees, are given in the following table. The figures are based on a check cruise of the area made in September 1928, during which each tree was located and checked as to status--living, felled or insect-killed.

As each tree was felled the numbered metal tag was removed from the trunk and nailed to the stump, so that it was possible to check the numbers of all the trees, both felled and standing.

Table 1

	Number of Trees			Volume in Bd.Ft.		
	Total	Per Acre	%	Total	Per Acre	%
Original stand, living	499	25	100%	195,560	9,778	100%
Stand removed	265	13	53	115,400	5,770	59
Stand remaining	234	12	47	80,160	4,008	41

The only loss that occurred on the area following cutting, during the summer of 1928, was caused by insects. This loss, for both the thinned and unthinned parts of the plot, is given in Table 2:

Table 2

	Thinned 20 Acres			Unthinned 20 Acres		
	No.Trees	Volume	% of Rem.Vol.	No.Trees	Volume	% of Rem.Vol.
Total stand after cutting	234	80,160	100%	480	154,090	100%
Killed by D.brevicomis	3	380	0.47%	16	5,450	3.54%
Killed by other insects	0	0	0	1	160	0.14%
Total loss	3	380	0.47%	17	5,610	3.68%

The above table shows that the loss caused by insects on the area from which the most susceptible trees were removed was proportionately much less than the loss on the unthinned area. Only 0.47 per cent of the stand left on the thinned area was killed, while 3.68 per cent of the stand on the unthinned area was killed, by insects. This in itself indicates a considerable reduction in the susceptibility of the thinned stand. A study of the trees killed on the two areas shows that the thin-

ning was even more effective than this table indicates. A reduction in the loss from insects other than the western pine beetle was not expected, so we should consider only the loss caused by this one beetle. Of the three trees killed on the cutover area the two largest were top-killed during the winter of 1927, before the area was thinned, and the other tree, only 10 inches in diameter, was killed by a combined attack of both D. brevicomis and D. monticolae. Thus it is seen that not a single tree was killed on the cutover area by the western pine beetle alone, whereas 16 trees were killed by the attacks of this beetle on the unthinned area.

The actual reduction of insect-loss that resulted from the thinning is shown in Table 3, in which the 1927 summer loss on both areas is compared with the 1928 summer loss on the same areas:

Table 3

Killed by D.brev.	Thinned 20 Acres			Unthinned 20 Acres		
	No.Trees	Volume	% of Vol.	No.Trees	Volume	% Vol.
1927 Summer	23	10,070	4.32%	40	14,080	7.55%
1928 "	3	390	0.47%	16	5,450	3.54%
Red.Vol.loss in %			90%			53%

This table shows that, even if we include the trees that were topkilled before the area was thinned, the removal of the most susceptible trees had a decided effect on the western pine beetle infestation on the thinned area. On the cutover area the insect loss in per cent of total volume was 90 per cent less in 1928 than in 1927, whereas the loss on the unthinned area was only 53 per cent less in 1928 than in 1927.

DISCUSSION AND CONCLUSIONS

It would be unsafe to draw any definite conclusions from this study at this time. The value of this experiment to date is limited because of the small size of the area and also because only a short time has passed since the area was cut over. It would be expected that the thinning of the stand would favor acceleration of growth in the trees that remained, so that the susceptibility of the stand would continue to decrease for a number of years.

However, in spite of the limitations of our data, it appears that the susceptibility to attack by the western pine beetle of even the weakest stands of western yellow pine can be greatly reduced by the careful selection of the trees to be cut, even though a relatively large volume is left on the area. On this area a stand of nearly 4,000 board feet to the acre was left. It is probable that the present Forest Service policy of leaving only 2,000 to 3,000 board feet on sites of this class will prove to be more advisable from both the entomological and the economic viewpoint.

RECOMMENDATIONS

The Timber Mountain plot, including both the thinned and unthinned areas, should be examined annually for a number of years and the insect losses carefully studied. Not only should the total amount of insect loss be determined, but also the insects or other factors contributing to the death of each tree.

A number of similar, xxxx or preferably larger, areas should be thinned with varying degrees of severity and studied for a number of years in order to provide sufficient data to warrant definite conclusions. It is hoped that a few such areas can be marked on the Badger Unit in 1929 in connection with the Pickering logging operation.

COMPARISON OF GROWTH RATE OF
LIVING TREES AND D. brevicomis KILLED TREES
TIMBER MT. SAMPLE PLOT

LIVING TREES ——— BASIS 94.5 TREES
D. brevicomis Killed Trees - - - - Basis 123 to 473 Trees

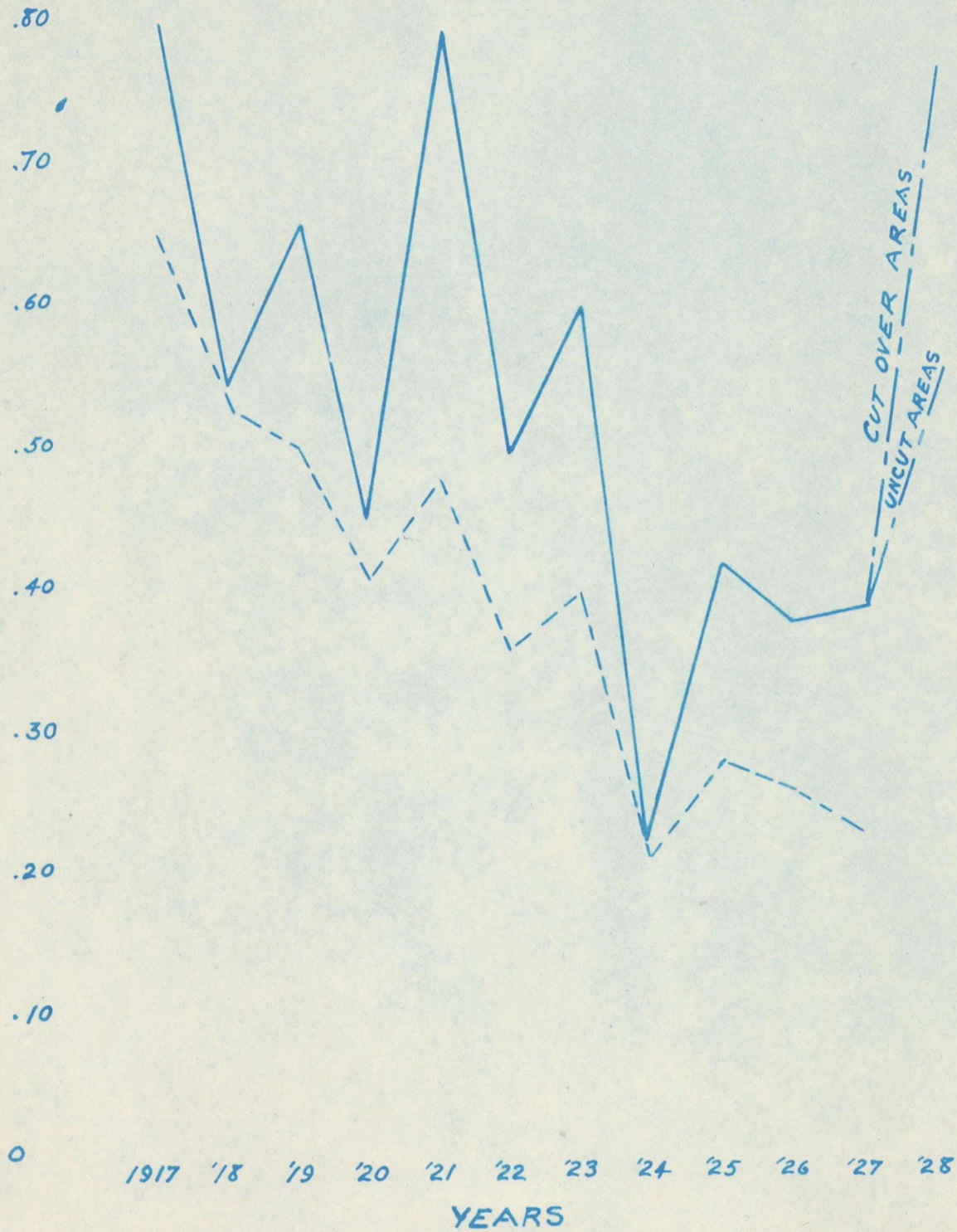

Photo 1. View from near the center of the thinned area, toward the north edge of the Timber Mt. Plot. Note the thin stand in the foreground, due to poor site and insect work, and the good reserve of comparatively thrifty trees across the north end of the plot. The old beetle-killed trees and the slash were to have been disposed of during the past winter.
Photo taken in September, 1928, by J.H. Miller.

Photo 2. Taken from near the center of the east side of the thinned area, looking northwest. The old stand has been killed by the western pine beetle. Note the old beetle-killed trees on the left and the heavy reproduction that is replacing the old stand.
Photo by J.M. Miller, September 1923